ST8050

User Guide

ST8050UG001

ST8050
User Guide

Revision 2.00

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1 Introduction

1.1 Overview

The SKYPATROL ST8050 is a highly configurable, dual mode solution that is ready for global use. The ST8050 is designed to communicate with terrestrial GSM cellular network systems when a cellular signal is available, and to slide seamlessly into its back-up mode to communicate with a satellite system when a cellular signal is not available. The ST8050 has additional processing power, memory, and input/outputs that allow sophisticated customer applications to run within the modem.

1.2 Scope

This document covers the key features of the ST8050, a description of the operating environment, instructions for setting up the modem including the installation and downloading of 'C' code, as well as an overview of the software architecture of the ST8050 modem. This interface allows programmers to prepare custom 'C' code applications. With use of the tools included in the API development environment, these applications can be embedded in the modem to take maximum advantage of the power and functionality of SKYPATROL products.

This manual is divided into 5 chapters and 1 appendix, which are summarized below:

Chapter 1: INTRODUCTION to the ST8050 modem contains the scope of the document, a list of related documents and information for contacting SKYPATROL.

Chapter 2: QUICK START GUIDE explains how to set up the modem, activate and provision it.

Chapter 3: ANTENNA SET UP describes how to set up the satellite and GSM/GPRS antennas for the best possible reception.

Chapter 4: ACTIVATING AND PROVISIONING THE MODEM discusses how to set up the connections between the modem and the satellite and terrestrial networks.

Chapter 5: NETWORK describes the Networks used by the device to transmit the messages.

Appendix A - Glossary of terms

Appendix B - ST8050 Connector Description

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1.3 Related documents

The following documents contain valuable information:

[1] ST8050AT001 - SkyPatrol AT Command
[2] ST8050UG002 - SKYPATROL Configuration Tool (SCT)

2 Quick Start Guide

The ST8050 operates from 6VDC to 32VDC. For satellite applications, optimal performance requires at least 10.5 VDC.

In order to communicate with the ST8050 the following is required:

- a computer with at least one available serial port or a USB-to-serial adapter (Keyspan, part number USA-19HS)
- a power supply capable of providing at least 3 amps at 12 V
- a ST8050 data cable
- an ST8050 modem.

2.1 Connecting the modem

2.1.1 ST8050

The SKYPATROL part number for the ST8050 assembly data cable is CBL092.

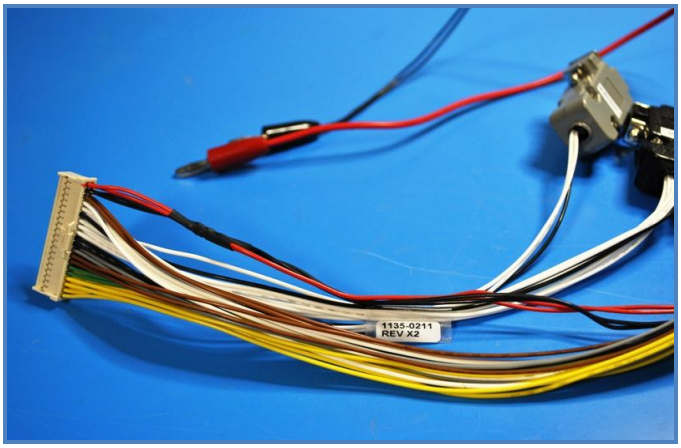


Figure 2-1: ST8050 assembly data cable

There are three main components of the ST8050 assembly data cable:

1. the locking connector
2. five serial DB9 connectors for use with the Logger port, MTS, AUX, GPS and GSM)
3. Power (red) and ground (black).

Figure 2-2: ST8050 assembly data cable components

Additional serial connections, I/O, and other signal lines are also available as non-terminated wires that come shrink-wrapped together in the assembly cable.

Plug the locking connector into the modem. The connector can only fit one way as shown below.

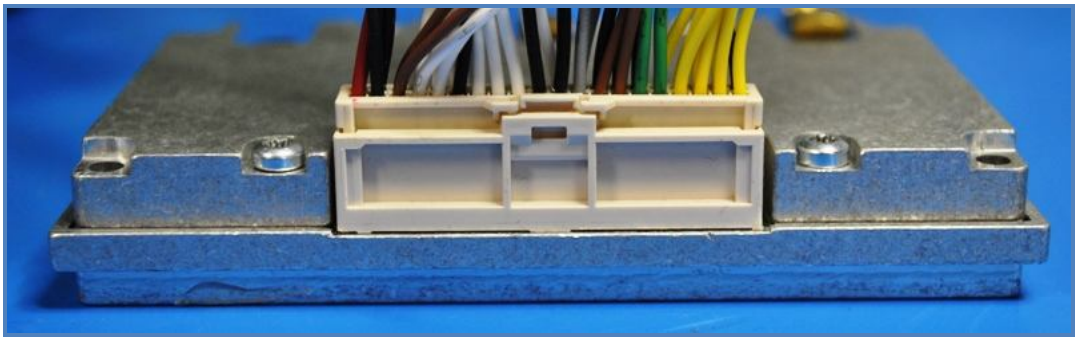


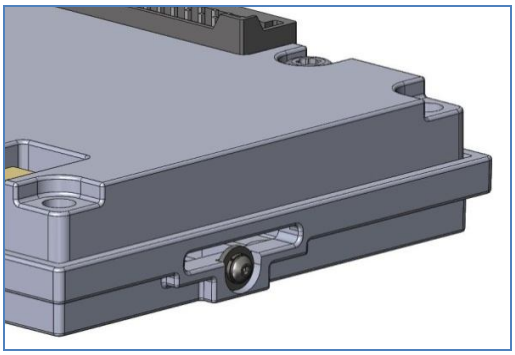
Figure 2-3: ST8050 locking connector

On the opposite side of the modem, attach the antenna cable to the appropriate connector (Figure 2-4).

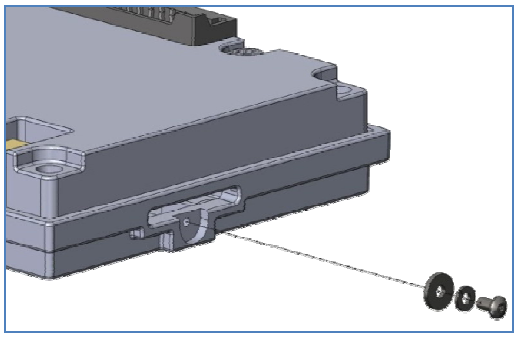
Figure 2-4: ST8050 antenna connections

2.1.1.1 Inserting the SIM card

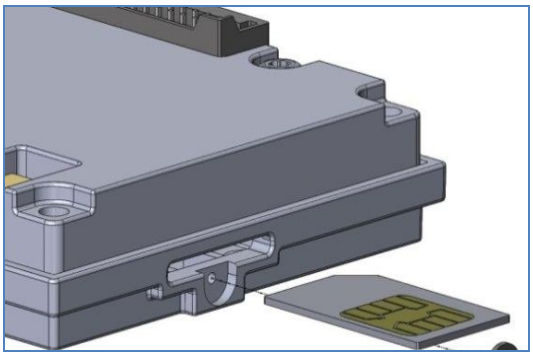
One of two types of screw is used to attach the SIM card to the modem. The screw will be a round head screw, Phillips, 0-80 X 3/16, SS, or a hex screw, size 0-80, 50th.



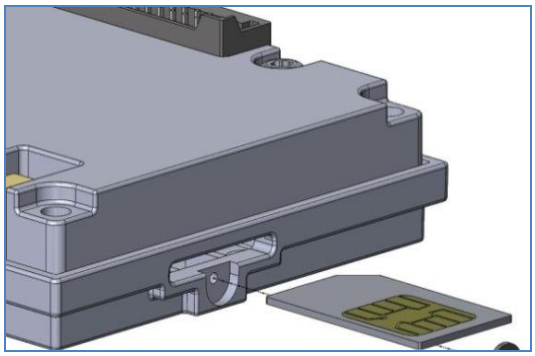
1. Find side of case with screw and washers.



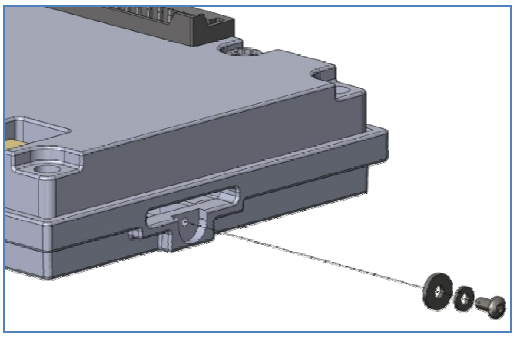
2. Remove screw and washers from side of case



3. Insert SIM card with the metal contacts facing upward.



4. Ensure SIM card clicks into place.



5. Replace the washers and screw.

2.2 Serial port connections

There are two ports that come terminated with DB9 connectors:

1. the Logger port - provides diagnostic data for the user
2. the MTS port - implements SKYPATROL's Communication Protocol (QCP)

2.3 Device setup

There are a number of parameters that may be configured as part of the application code. These parameters control the periodic reporting time, IO alarms, Analog alarms, speed alerts and other modem functions.

Those parameters are setup in the device via AT commands, using the MST port. When connecting to the MTS port, the default settings are:

Baud rate: 57600 bps
Data bits: 8
Parity: None
Stop bits: 1
Flow control: None

2.3.1 GRPS configuration

The ST8050 uses the GRPS network or Iridium network (if GPRS is not available) to send the message.

Use AT&STGPRS command to setup all parameters related with the GPRS network.

AT&STGPRS=<apn>,<user>,<password>,<protocol>,<ip>, <port>

<apn>	GPRS APN provided by the telecom operator
<user>	GPRS username provided by the telecom operator
<password>	GPRS password provided by the telecom operator
<protocol>	Transport protocol used to communicate with the server. 0: TCP 1: UDP
<ip>	The server hostname or IP address. Ex.: xyz.com or 000.000.000.000
<port>	The server port which the ST8050 must connect.

Example: AT&STGPRS=proxy,,,1,10.0.0.10,1730

2.3.2 Periodic report configuration

The ST8050 will send messages, depending on message format, using GRPS network or Iridium network. The periodic report timers are defined bases in the state of IO 1 (ignition).

Use AT&STREPORT command to setup those timers

AT&STREPORT=<mode>,<format>, <GPRS mask>, <Iridium mask>, <GPRS time On>, < GPRS time Off>, <Iridium time ON>, <Iridium time Off>, <GPRS distance>, <Iridium distance>

<mode>	Report mode, indicates what condition must be used to report: 0: Time condition 1: Distance condition 2: Time or distance condition
<format>	Indicates how the protocol must be formatted to be transmitted. 0: Binary 1: ASCII
<GPRS mask>	Indicates which parameters will be embedded in the report, this parameter is a numerical value in which each bit represents a parameter as indicated by the following bit mask: Bit 0 – Location Data Bit 1 – Digital Port Status Bit 2 –Analog Ports Value Bit 3 – GSM Strength Bit 4 – Iridium Strength Bit 5 – GSM Network Information Bit 6 – GSM SIMCARD information Bit 7 – Used by the ST8050 to indicate that an alarm was triggered.
<Iridium mask>	Same as GPRS Mask
<GPRS time On>	This parameter indicates the time interval in seconds that the unit must report if the Digital port 1 level is high and the GPRS modem has signal. 0 – Disable the report in this condition. Range: 20 to 65535 seconds

<GPRS time Off>	This parameter indicates the time interval in seconds that the unit must report if the Digital port 1 level is low and the GPRS modem has signal. 0 – Disable the report in this condition. Range: 20 to 65535 seconds
<Iridium time On>	This parameter indicates the time interval in seconds that the unit must report if the Digital port 1 level is high and the GPRS modem has no signal or is disabled. 0 – Disable the report in this condition. Range: 60 – 65535 seconds
<Iridium time Off>	This parameter indicates the time interval in seconds that the unit must report if the Digital port 1 level is low and the GPRS modem has no signal or is disabled. 0 – Disable the report in this condition. Range: 60 – 65535 seconds
<GPRS distance>	This parameter indicates the distance interval in meters that the unit must move before report. 0 – Disable the report in this condition. Range: 0 – 65535 x 100 meters
<Iridium distance>	This parameter indicates the distance interval in meters that the unit must move before reporting. 0 – Disable the report in this condition. Range: 0 – 65535 x 100 meters

Example: The device will report by GPRS every 5 minutes when the ignition is ON, every 1 hour when ignition is OFF and it will report by Iridium every 15 minutes when the ignition is ON, every 4 hours when ignition is OFF

AT&STREPORT=0,1,127,127,300,3600,900,14400,0,0

2.3.3 IO alarms

The ST8050 uses the IO alarms to notify the end user of all events which are triggered by external sensors connected to the device. IO alarms can be used for ignition, open doors, panic buttons, etc.

The AT&STDIOALARM command to setup all IO alarms

AT&STDIOALARM=<port id>,<trigger type>, <condition>, <min duration>

Port ID	Id of the port where the trigger will be created. Range: 1 to 8

Trigger Type	Define the type of the trigger 0: Disable 1: Report immediately after the condition is met. 2: Execute a time counter while the condition is met.
Condition	Define the condition to trigger the alarm. 0: When the port level goes UP. 1: When the port level goes DOWN. 2: When the port level changes, UP or DOWN, this condition is not valid if the trigger type is 2.
Minimum duration	Indicates the time that the condition must be in valid state before trigger the alarm. Value in seconds. Range: 0 to 255

Example: AT&STIOALARM=1,1,2,2

2.4 Downloading code to the modem

The ST8050 uses two separate code packages: the **foundation** and the **application**. The foundation and application are supplied by Skypatrol. Either can be loaded into the modem using the SKYPATROL Configuration Tool (SCT).

The **application code package** is a loadable software file that may or may not be present in the modem. If this file is not present, the modem acts as a simple satellite or GPRS/GSM modem that is controlled externally via a serial interface. Alternatively, for more complex applications a developer can create a custom application in C code to be embedded in the modem.

If the software developer writes a custom application that will be loaded into the modem by SKYPATROL's production line, it is imperative to ensure that the application sets any of the parameters associated with baud rates and power-down modes during boot up.

The **foundation code package** consists of code to implement the Session, Transport and Network layers of the satellite/terrestrial protocol. The application and the foundation are independent tasks within the modem. The application sends and receives messages to and from the foundation, and the foundation sends and receives messages over the RF or GPRS/GSM links.

The modem is loaded with foundation code when it leaves the factory. New foundation code may be obtained from the SkyPatrol's *ftp* at ftp://ftp.skypatrol.com, using the user's assigned username and password.

2.4.1 SKYPATROL Configuration Tool (SCT)

The SKYPATROL Configuration Tool (SCT) provides a Graphical User Interface (GUI) to download code and modify configuration parameters in the modem. SCT is available on the SkyPatrol's *ftp* at ftp://ftp.skypatrol.com.

To download code or modify configuration parameters, first load and run SCT on a PC connected to the modem's MTS serial port. When connecting to the MTS port, the default settings are:

Baud rate: 57600 bps
Data bits: 8
Parity: None
Stop bits: 1
Flow control: None

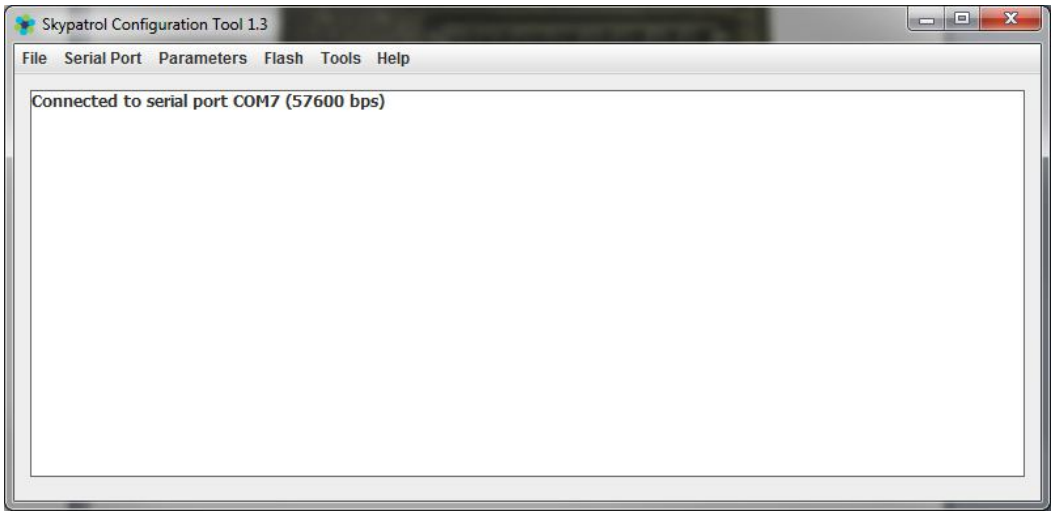


Figure 2-5: SCT – Initial screen

2.4.1.1 Downloading foundation code

If it is necessary to update the foundation (firmware) code, download the zip file from the SkyPatrol's ftp at ftp://ftp.skypatrol.com. After unzipping the file, there should be a foundation file with the name format of **Q4Kf-xGT-n.n.nnnn.nnn-ENC.bin.**

1. In SCT, select Flash →Load Firmware

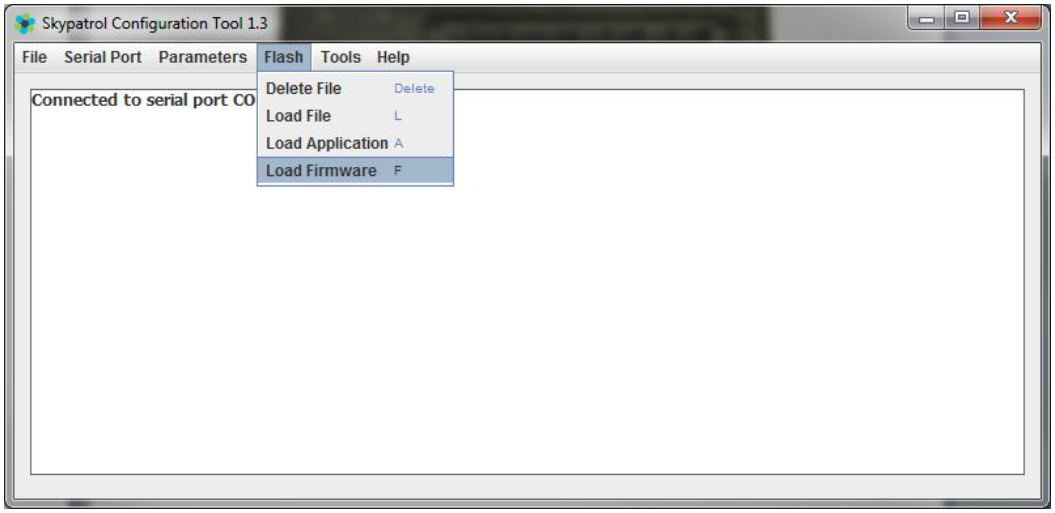

Skypatrol Configuration Tool 1.3
File Serial Port Parameters Flash Tools Help
Connected to serial port CO
Delete File Delete
Load File L
Load Application A
Load Firmware F

Figure 2-6: SCT – Update the firmware (1)

2. Enter the foundation file's address and select Update

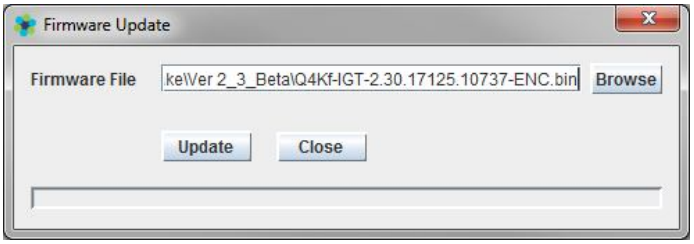


Figure 2-7: SCT – Update the firmware (2)

3. SCT starts the firmware update. Power cycle the modem.

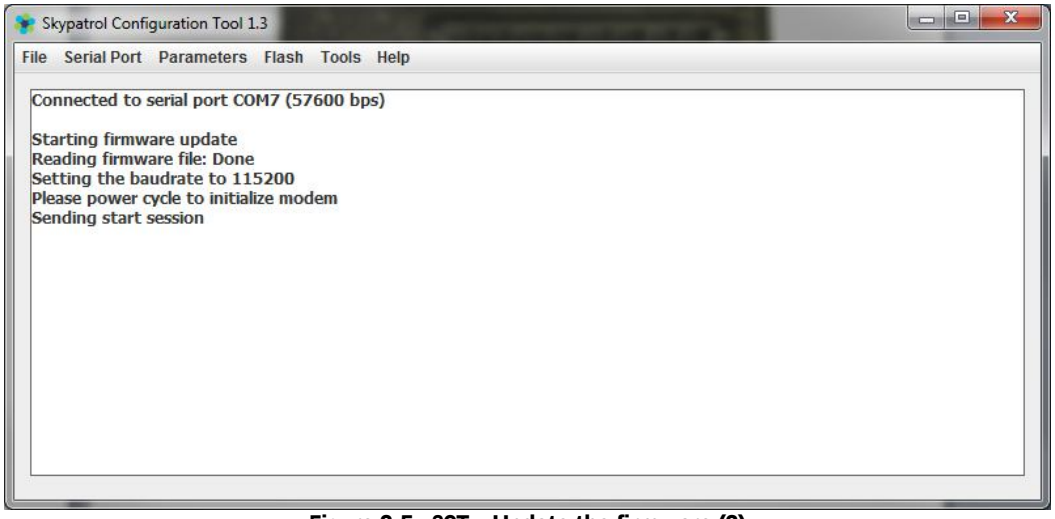

Skypatrol Configuration Tool 1.3
File Serial Port Parameters Flash Tools Help
Connected to serial port COM7 (57600 bps)
Starting firmware update
Reading firmware file: Done
Setting the baudrate to 115200
Please power cycle to initialize modem
Sending start session

Figure 2-5: SCT – Update the firmware (3)

4. The progress bar will indicate when the file is loaded.

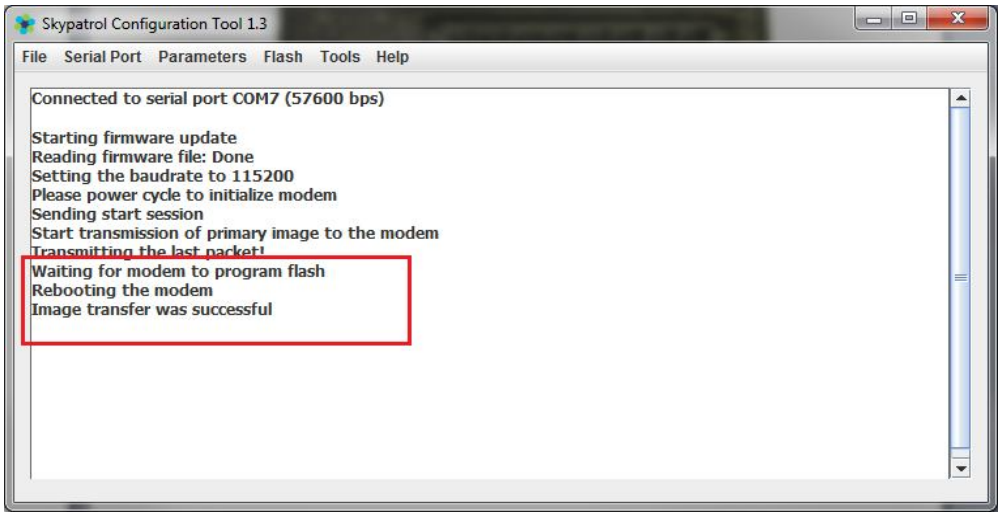

Skypatrol Configuration Tool 1.3
File Serial Port Parameters Flash Tools Help
Connected to serial port COM7 (57600 bps)
Starting firmware update
Reading firmware file: Done
Setting the baudrate to 115200
Please power cycle to initialize modem
Sending start session
Start transmission of primary image to the modem
Transmitting the last packet!
Waiting for modem to program flash
Rebooting the modem
Image transfer was successful

Figure 2-9: Completion of successful download (using SCT)

2.4.1.2 Downloading application code

2.4.2 Downloading

Download the latest ST8050 .bin file from the SkyPatrol's ftp. After unzipping the file, there should be a Turnkey file with the name format of **ST8050_9,9.99.bin**.

1. On the QCT screen, select **Flash →Load Application.**

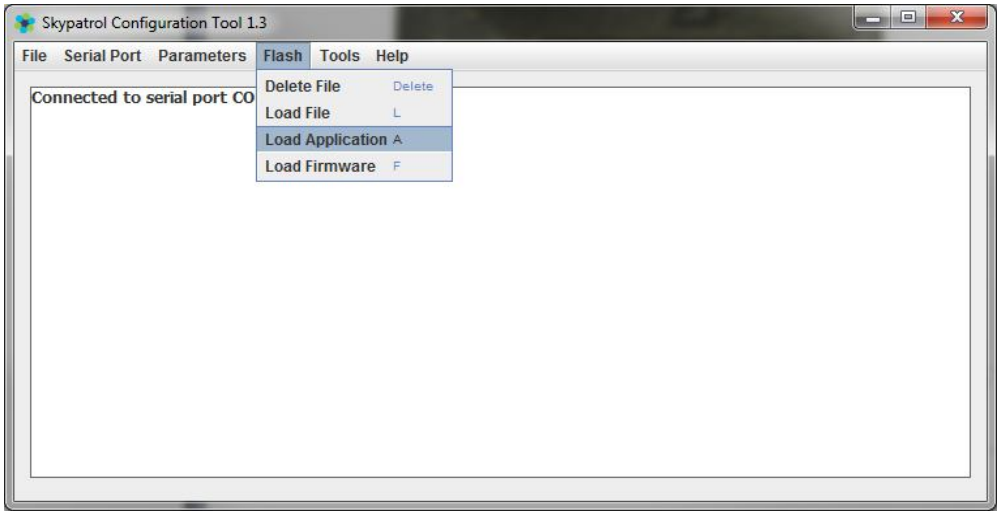

Skypatrol Configuration Tool 1.3
File Serial Port Parameters Flash Tools Help
Connected to serial port CO
Delete File Delete
Load File L
Load Application A
Load Firmware F

Figure 2-10: SCT – Update Application (1)

2. After entering the address, select Load

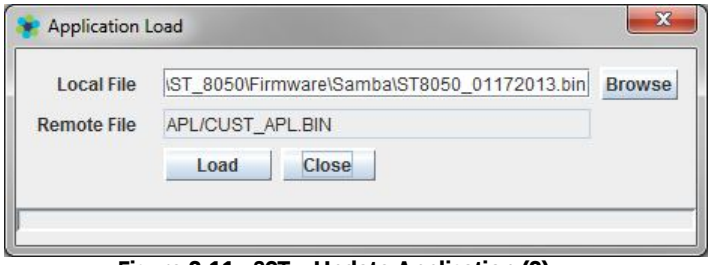
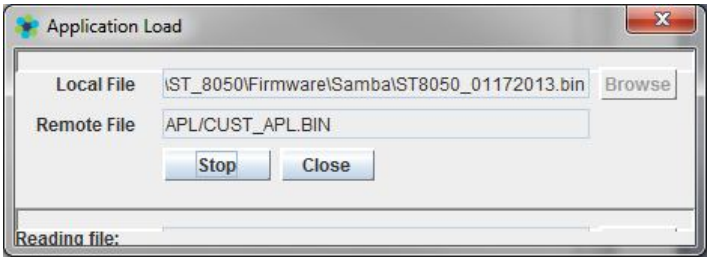


Figure 2-11: SCT – Update Application (2)

3. The progress bar will indicate when the file is loaded.



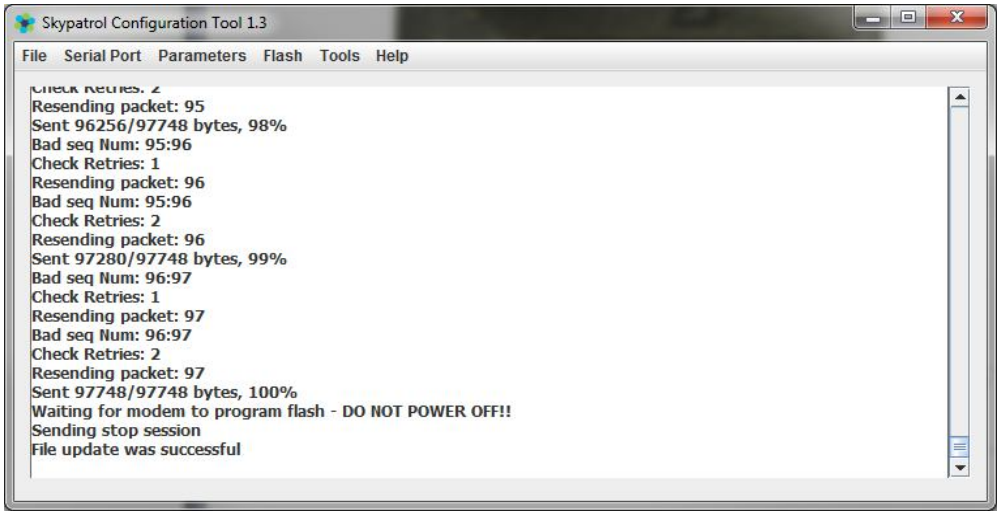

Skypatrol Configuration Tool 1.3
File Serial Port Parameters Flash Tools Help
Resending packet: 95
Sent 96256/97748 bytes, 98%
Bad seq Num: 95:96
Check Retries: 1
Resending packet: 96
Bad seq Num: 95:96
Check Retries: 2
Resending packet: 96
Sent 97280/97748 bytes, 99%
Bad seq Num: 96:97
Check Retries: 1
Resending packet: 97
Bad seq Num: 96:97
Check Retries: 2
Resending packet: 97
Sent 97748/97748 bytes, 100%
Waiting for modem to program flash - DO NOT POWER OFF!!
Sending stop session
File update was successful

Figure 2-6: Completion of successful download (using SCT)

2.5 Provisioning and activation

Upon receipt of the ST8050, it is necessary to activate and provision the GSM/GPRS service and/or the satellite service before using the modem to transmit messages.

- GSM/GPRS customers must obtain a SIM card from their carrier and place it into the SIM slot located on the side of the ST8050. See Section 2.1.1.1 on how to install the SIM card.

Initially, many users create a new email address for modem messages. It is best to set up this new mailbox for testing purposes to avoid a flood of modem messages into the user's daily use email.

See Chapter 4 for more information on activating and provisioning the modem.

2.6 Configuration Parameters

There are a number of parameters that may be configured as part of the application code. These parameters control the periodic reporting time, IO alarms, Analog alarms, speed alerts and other modem functions.

Those parameters are setup in the device via AT commands, using the MST port. When connecting to the MTS port, the default settings are:

Baud rate: 57600 bps
Data bits: 8
Parity: None
Stop bits: 1
Flow control: None

2.6.1 GRPS configuration

The ST8050 uses the GRPS network or Iridium network (if GPRS is not available) to send the message.

Use AT&STGPRS command to setup all parameters related with the GPRS network.

AT&STGPRS=<apn>,<user>,<password>,<protocol>,<ip>, <port>

<apn>	GPRS APN provided by the telecom operator
<user>	GPRS username provided by the telecom operator
<password>	GPRS password provided by the telecom operator
<protocol>	Transport protocol used to communicate with the server. 0: TCP 1: UDP
<ip>	The server hostname or IP address. Ex.: xyz.com or 000.000.000.000
<port>	The server port which the ST8050 must connect.

Example: AT&STGPRS=proxy,,,1,10.0.0.10,1730

2.6.2 Periodic report configuration

The ST8050 will send messages, depending on message format, using GRPS network or Iridium network. The periodic report timers are defined bases in the state of IO 1 (ignition).

Use AT&STREPORT command to setup those timers

AT&STREPORT=<mode>,<format>, <GPRS mask>, <Iridium mask>, <GPRS time On>, < GPRS time Off>, <Iridium time ON>, <Iridium time Off>, <GPRS distance>, <Iridium distance>

<mode>	Report mode, indicates what condition must be used to report: 0: Time condition 1: Distance condition 2: Time or distance condition
<format>	Indicates how the protocol must be formatted to be transmitted. 0: Binary 1: ASCII
<GPRS mask>	Indicates which parameters will be embedded in the report, this parameter is a numerical value in which each bit represents a parameter as indicated by the following bit mask: Bit 0 – Location Data Bit 1 – Digital Port Status Bit 2 –Analog Ports Value Bit 3 – GSM Strength Bit 4 – Iridium Strength Bit 5 – GSM Network Information Bit 6 – GSM SIMCARD information Bit 7 – Used by the ST8050 to indicate that an alarm was triggered.
<Iridium mask>	Same as GPRS Mask
<GPRS time On>	This parameter indicates the time interval in seconds that the unit must report if the Digital port 1 level is high and the GPRS modem has signal. 0 – Disable the report in this condition. Range: 20 to 65535 seconds
<GPRS time Off>	This parameter indicates the time interval in seconds that the unit must report if the Digital port 1 level is low and the GPRS modem has signal. 0 – Disable the report in this condition. Range: 20 to 65535 seconds

<Iridium time On>	This parameter indicates the time interval in seconds that the unit must report if the Digital port 1 level is high and the GPRS modem has no signal or is disabled. 0 – Disable the report in this condition. Range: 60 – 65535 seconds
<Iridium time Off>	This parameter indicates the time interval in seconds that the unit must report if the Digital port 1 level is low and the GPRS modem has no signal or is disabled. 0 – Disable the report in this condition. Range: 60 – 65535 seconds
<GPRS distance>	This parameter indicates the distance interval in meters that the unit must move before report. 0 – Disable the report in this condition. Range: 0 – 65535 x 100 meters
<Iridium distance>	This parameter indicates the distance interval in meters that the unit must move before reporting. 0 – Disable the report in this condition. Range: 0 – 65535 x 100 meters

Example: The device will report by GPRS every 5 minutes when the ignition is ON, every 1 hour when ignition is OFF and it will report by Iridium every 15 minutes when the ignition is ON, every 4 hours when ignition is OFF

AT&STREPORT=0,1,127,127,300,3600,900,14400,0,0

2.6.3 IO alarms

The ST8050 uses the IO alarms to notify the end user of all events which are triggered by external sensors connected to the device. IO alarms can be used for ignition, open doors, panic buttons, etc.

The AT&STDIOALARM command to setup all IO alarms

AT&STDIOALARM=<port id>,<trigger type>, <condition>, <min duration>

Port ID	Id of the port where the trigger will be created. Range: 1 to 8
Trigger Type	Define the type of the trigger 0: Disable 1: Report immediately after the condition is met. 2: Execute a time counter while the condition is met.

Condition	Define the condition to trigger the alarm. 0: When the port level goes UP. 1: When the port level goes DOWN. 2: When the port level changes, UP or DOWN, this condition is not valid if the trigger type is 2.
Minimum duration	Indicates the time that the condition must be in valid state before trigger the alarm. Value in seconds. Range: 0 to 255

Example: AT&STIOALARM=1,1,2,2

3 Antenna setup

3.1 Antenna recommendations

3.1.1 GPS

The GPS antenna should be 3.3 VDC active. The recommended active antenna gain should be in the range of 17dB to 42 dB in the Low Noise Amplifier (LNA). Ensure that the GPS antenna is located where it has an unobstructed view of the sky. Active antennas are usually low-profile patch types.

3.1.2 Iridium

Iridium antennas must be approved by Iridium before being used on the Iridium network. A list of approved antennas can be found on Iridium's home page at www.iridium.com.

When selecting an Iridium antenna, make sure it is 50 ohm, Gain 3dBi maximum, polarization Right Hand Circular Polarized (RHCP) and VSWR 1.5:1 or better (in both receive and transmit bands) for optimal messaging. Make sure that the Iridium antenna is located where it has an unobstructed view of the sky.

There cannot be more than a 3 dB loss between the antenna and the modem.

The antenna must be placed greater than 20cm from a person. If antenna is placed within 20cm of a person, the system integrator needs to assess the final product against SAR regulation.

3.1.3 GSM/GPRS

The GSM/GPRS antenna does not require an unobstructed view of the sky. However, for optimal performance, an unobstructed view is preferable.

GSM antenna requirements

- Gain must be less than 3dBi.
- Must be placed greater than 20cm from a person. If antenna is placed within 20cm of a person, the system integrator needs to assess the final product against SAR regulation.
- If the antenna is co-located and transmitting simultaneously with another antenna, additional FCC/IC testing may be required.
- Antenna cannot be placed within a metal shield and must be installed with care to avoid any interference with other electronic devices.

3.2 Grounding

Grounding may be done in several ways:

- Fixed Site: Grounding Rods should be connected to the antenna shield. Keep grounding systems as short as possible.
- Mobile: Chassis Ground should be connected to the negative side of the battery. Make sure all connections are corrosion free.
- Marine Grounding Systems: Skilled marine electricians should be consulted when adding an ORBCOMM solution.

Beware of high power antennas, urban canyons and other structures that block the line of sight (LOS) to the satellite. Below are some antenna installation mishaps:

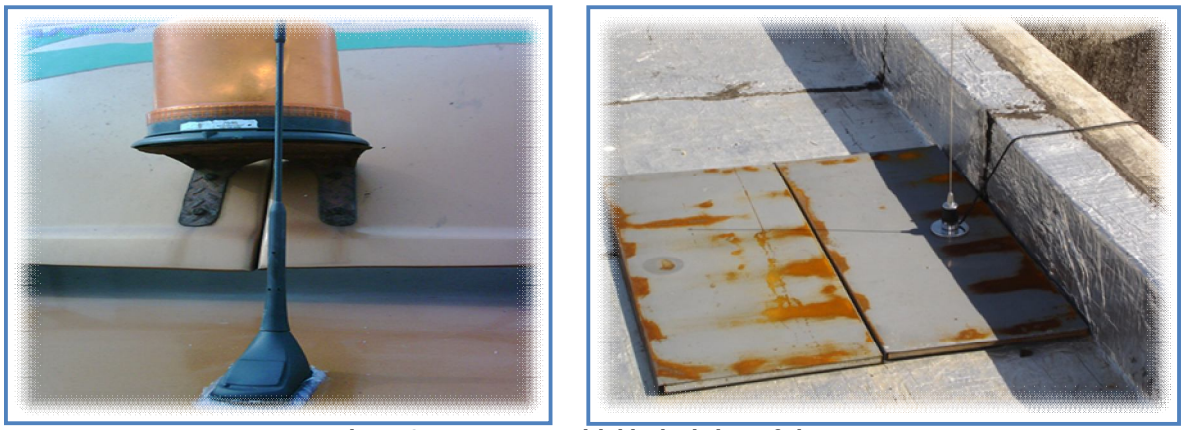


Figure 3-1: Antennas with blocked view of sky

Figure 3-2: Tipped over antenna

3.3 Noise problems

To locate noise problems, start with a visual inspection of RF connectors. Look for water leakage or corrosion. A spectrum analyzer, VSWR meter or noise detector is helpful for locating problems. Noise sources for broadband may be electric power lines, electric motors or generators, switching power sources or microprocessors. Noise sources for narrowband may be radio/TV towers, pager transmitters or cell phones.

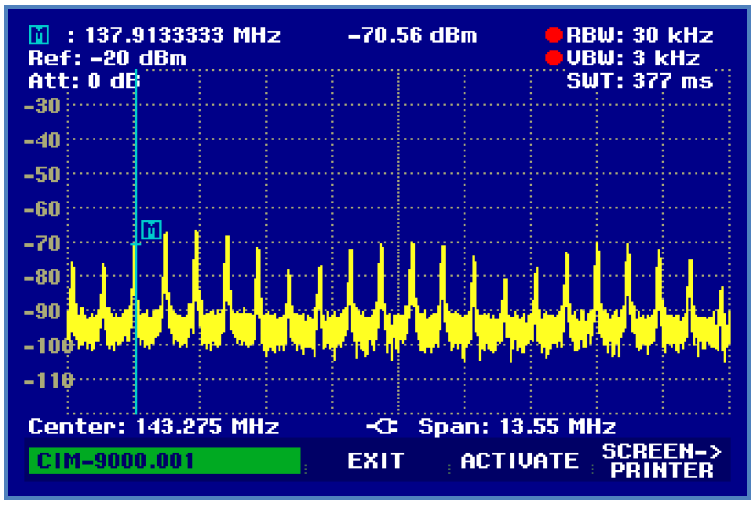


Figure 3-3: Noise - radiated and conducted

Noise suppression parts include ferrite beads, EMI cores and RF filters. Techniques include twisting power lines, separating power from signal, using right angles, covering the band of interest and double wrapping wire and placing it near the noise source.

4 Activating and provisioning the modem

Each ST8050 must be provisioned and activated on the network(s) supported by the modem. The customer is responsible for activating and provisioning the modem(s). The following information is required for provisioning and activation.

4.1 GPRS

4.1.1 Activation

GPRS SIM cards may be activated using any GSM/GPRS provider with an applicable data plan. The data plan must use **APN addressing** for the modem and must support **data transfer**. For example, T-Mobile APN address is **"intenrtnet.voicestream.com".** Different networks have their own requirements for APN addressing, usernames and passwords. Please consult the appropriate airtime reseller for more information on using the GPRS network. Be sure to configure the APN address and the SMTP and POP QCFG parameters if GPRS will be used.

4.2 Iridium

4.2.1 Activation

The modem has an **IMEI number** for activation with the Iridium network. This number is located on the modem's white label.

The IMEI number must be activated with Iridium or an airtime reseller before the modem can be used. If a message is sent without the modem being activated, it is ignored by the Iridium network. For this reason, it is possible to develop and send live messages without the modem being "turned off" by the network.

4.2.2 Provisioning

There are several ways the modem can be provisioned with Iridium. It can be provisioned:

- With one to five **email/ID** addresses. Each modem-originated message is sent to **all** the email addresses with which the modem is provisioned.
    - If you want to specify which of the (one to five) email addresses should receive the message you can implement your own system for directing email:
        1. Have the modem send the message to a server.
        2. The server reads the email contents and directs the emails to different addresses depending on a byte in the message contents. .
- To work with Iridium's **Direct IP** gateway. Messages are sent directly to and from the server(s) of the customer's backend over a TCP connection.
- To send messages to another **Short Burst Data modem** with an IMEI number or to itself (for testing purposes).
- To receive Geodata and Ring Alerts.
    - Geodata is an estimate of the latitude and longitude of the modem.
    - Ring Alerts provide notification when there are mobile terminated messages waiting for the modem.

For modems utilizing the Direct IP gateway, the user's IP gateway and port number must be added to the Iridium firewall. This may require an extra day or two to be provisioned.

The above mechanisms can also be combined so that a modem can do both Direct IP and email-based message sending. Provisioning of the modem can also be edited from Iridium's SPNET portal. Contact Iridium or an Iridium Airtime Reseller for provisioning.

5 Networks

5.1 Iridium

Short Burst Data (SBD) is a service for the Iridium satellite network. The Iridium satellite network is a world-wide, two-way, data communication system. Communications between modems and the Iridium ground network are accomplished via a constellation of low-earth orbit (LEO) satellites. There are 66 operational satellites with additional spares that operate in 6 polar planes with pole to pole coverage at all times.

The ground network is comprised of the System Control Segment and gateways used to connect to the terrestrial data networks. The System Control Segment is the central management component for the Iridium satellite network. It provides support and control services for the satellite constellation and delivers satellite tracking data to the gateways.

The maximum mobile originated message size through the Iridium network is 340 bytes. The maximum mobile terminated message size is 270 bytes.

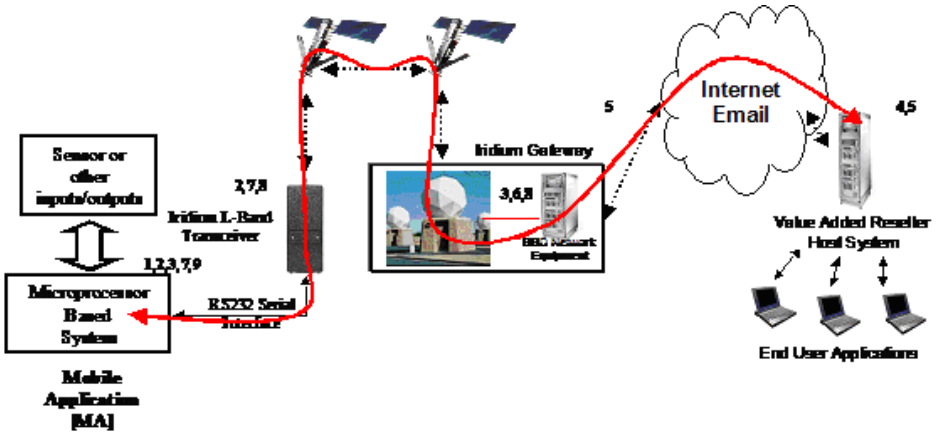


Figure 5-1: Iridium network diagram

5.1.1.1 Sequence of events: Mobile Originated–Short Burst Data message (MO-SBD)

1. User's application creates the mobile-originated-SBD message in the ST8050.
2. Application instructs the ST8050 to send the SBD message to the Iridium Gateway.
3. Iridium Gateway SBD equipment:
   - Receives the SBD message
   - Sends an acknowledgement to the modem
   - Creates an email message with the SBD data message as an attachment to the email or establishes a DirectIP connection.
4. The message is sent to the destination server hosted by the Value Added Reseller for processing.

5.1.1.2 Sequence of events: Mobile Terminated–Short Burst Data message (MT-SBD)

1. The message is sent to the Iridium Gateway server by the Value Added Reseller's host server via email or a DirectIP connection.
2. Iridium Gateway SBD equipment receives the message and stores it in a database.
3. Modem initiates a "Mailbox Check" either alone or in response to a Ring Alert, and the message is downloaded to the modem.
4. Modem sends an acknowledgement to the Iridium Gateway that the mobile-terminated-SBD message has been delivered.
5. Application extracts the mobile-terminated-SBD message from the modem and processes the message.

5.2 GSM

The following services use the GSM network: FTP, SMS, TCP, UDP and SMTP/POP.

Appendix A – Glossary of terms

ADC	Analog to Digital Converter
API	Application Programming Interface
BPS	Bits per Second
CAN	Controller Area Network
CD	Carrier Detect Signal
CR	Carriage Return
DIO	Digital Input/Output
DTE	Data Terminal Equipment
DTR	Data Terminal Ready signal
EDA	Event Driven Architecture
FFS	Flash File System
FTP	File Transport Protocol
GPRS	General Packet Radio Service
GPS	Global Positioning System
GSM	Global System for Mobile communications
GUI	Graphical User Interface
ICD	Interface Control Drawing
IDE	Integrated Development Environment
IDP	IsatData Pro – an Inmarsat service
IMEI	International Mobile Equipment Identity
IMS	International Mobile Subscriber identify
INMR	Inmarsat
IRI	Iridium
LEO	Low Earth Orbit
LF	Line Feed
LOS	Line Of Sight
LSB	Least Significant Bit
MHz	Megahertz
MID	Message Identification
MO	Mobile Originated (Iridium network)
MT	Mobile Terminated (Iridium network)
MTS	Main Transport Socket
NCC	Network Control Center
NMEA	National Marine Electronics Association
NVM	Non-Volatile Memory
O/R	Originator/Recipient
ORB	ORBCOMM
OSI	ORBCOMM Serial Interface
OTA	Over the Air
PGN	Parameter Group Number
POP	Post Office Protocol
QCFG	SKYPATROL Configuration Parameter
QCP	SKYPATROL Configuration Protocol
QCT	SKYPATROL Configuration Tool
QFFS	SKYPATROL Flash File System
QMM	SKYPATROL Memory Manager

QRTOS	SKYPATROL Real-time Operating System
RPM	Revolutions Per Minute
RTC	Real-time Clock
RTOS	Real-time Operating System
SAE	Society of Automotive Engineers
SBD	Short Burst Data
SC	Subscriber Communicator (modem) [ORBCOMM]
SCO	Subscriber Communicator Originated message
SCT	Subscriber Communicator Terminated message
SMTP	Simple Mail Transfer Protocol
UART	Universal Asynchronous Receiver/Transmitter
VHF	Very High Frequency
VSWR	Voltage Standing Wave Ratio

Appendix B – ST8050 Connector Description

The ST8050 connector has 40 pins connector. Each pin has the following function:

Pin	Signal	Type	Voltage (Min/Max/ Nominal) VDC	Notes
1	**UBATT (+)**	Power	6/32/12	
2	**UBATT (+)**	Power	6/32/12	
3	**UBATT (-)**	Ground		
4	**UBATT (-)**	Ground		
5	**3V5_500MA**	Continuous Output	+/- 1%@650mA	Used to pull the digital input port signal to high
6	**3V5_500MA**	Continuous Output	+/- 1%@650mA	Used to pull the digital input port signal to high
7	**NOT USED**			
8	**NOT USED**			
9	**NOT USED**			
10	**NOT USED**			
11	**GND**	Ground		
12	**NOT USED**			
13	**MTS_RXD_RS232**	Output		Serial Port RX
14	**NOT USED**			
15	**MTS_TXD_RS232**	Input		Serial Port TX
16	**MTS_DSR_RS232**	Output		Serial Port DSR
17	**MTS_DTR_RS232**	Input	6/32	Serial Port DTR
18	**MTS_DCD_RS232**	Output		Serial Port DCD
19	**GND**	Ground		
20	**LOG_TXD_RS232**	Input		
21	**GND**	Ground		
22	**LOG_RXD_RS232**	Output		
23	**CANH**	Input/Output		CAN High signal
24	**CANL**	Input/Output		CAN Low signal
25	**SW_UBATT_0**	Output	UBATT(+)/1A@25C	Switched Relay
26	**SW_GND_0**	Output	GND/1A@25C	Switched Relay
27	**SW_UBATT_1**	Output	UBATT(+)/1A@25C	Switched Relay
28	**SW_GND_1**	Output	GND/1A@25C	Switched Relay
29	**ANA1**	Input	0-3.5	Analog port 1
30	**GND**	Ground		
31	**ANA2**	Input	0-3.5	Analog port 2

32	**DIG_1**	Input	3.5V CMOS/TTL	Used to monitor the vehicle ignition state
33	**DIG_2**	Input	3.5V CMOS/TTL	Used to monitor the SOS button
34	**DIG_3**	Input	3.5V CMOS/TTL	
35	**DIG_4**	Input	3.5V CMOS/TTL	
36	**DIG_5**	Input	3.5V CMOS/TTL	
37	**DIG_6**	Input	3.5V CMOS/TTL	
38	**DIG_7**	Input	3.5V CMOS/TTL	
39	**DIG_8**	Input	3.5V CMOS/TTL	
40	**GND**	Ground